

AMENDMENTS TO THE CLAIMS:

This listing of claims replaces all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Previously Presented) A fuel cell system comprising:

a fuel cell comprising an anode, a cathode, and an ion exchange membrane between the anode and the cathode;

a fuel delivery conduit comprising:

a fluid flow field plate forming part of the anode, having a fluid flow channel extending through the fluid flow plate;

a fuel delivery inlet coupled to one end of the fluid flow channel;

a fuel delivery outlet coupled another end of the fluid flow channel; and

a fluid flow regulator for controllably varying a quantity of fuel delivered to a mixing point adjacent to the fuel delivery inlet;

a recirculation conduit for the anode, the recirculation conduit extending between the fuel delivery outlet and the fuel delivery inlet via the mixing point, wherein the mixing point is external to the fuel cell and comprises either (i) a reaction chamber for reacting fuel, or (ii) a pre-mixing chamber, the mixing point for mixing fuel from the fluid flow regulator with oxidant species from the recirculation conduit; and

detection means for detecting a level of oxidant species present in at least part of the fuel delivery conduit, wherein the detection means comprises means for testing an open circuit voltage across the anode and cathode of the fuel cell.

2 to 4. (Canceled)

5. (Previously Presented) A fuel cell system according to claim 1, wherein the reaction chamber includes a catalyst material.

6. (Canceled)

7. (Previously Presented) A fuel cell system according to claim 1, wherein the recirculation conduit is switchably connected to the fuel delivery outlet via a two way valve.

8 and 9. (Canceled)

10. (Previously Presented) A fuel cell system according to claim 1, further comprising:
control means for switching the fuel cell between a normal mode of operation in which a relatively high flow rate of fuel is delivered to the anode and oxidant is delivered to the cathode, and a recirculation mode in which a relatively low flow rate of fuel is delivered to the anode together with oxidant delivered via the recirculation conduit.

11. (Previously Presented) A fuel cell system according to claim 1, further comprising:

control means for switching the fuel cell between a normal mode of operation in which a relatively high flow rate of fuel is delivered to the anode and oxidant is delivered to the cathode, and a recirculation mode in which a relatively low flow rate of fuel is delivered into the fuel delivery conduit together with oxidant delivered via the recirculation conduit.

12. (Previously Presented) A fuel cell system according to claim 1, further comprising:
an oxidant supply conduit extending from an oxidant supply to the mixing point.

13. (Previously Presented) A fuel cell system according to claim 12, further comprising:
an oxidant flow regulator for controllably varying a quantity of oxidant delivered to the mixing point.

14. (Previously Presented) A fuel cell system according to claim 13, wherein the oxidant flow regulator comprises a valve coupling the oxidant supply conduit to a cathode oxidant delivery conduit.

15. (Previously Presented) A fuel cell system according to claim 12, wherein the mixing point comprises a reaction chamber for reacting fuel from said fluid flow regulator with oxidant species from said oxidant supply conduit.

16. (Previously Presented) A fuel cell system according to claim 15, wherein the reaction chamber includes a catalyst material.

17. (Previously Presented) A fuel cell system according to claim 1, further comprising:
means for effecting a controlled combustion of fuel and oxidant species within a cathode
fluid delivery conduit.

18. (Previously Presented) A fuel cell system according to claim 17, wherein the
cathode fluid delivery conduit comprises:
a fluid flow field plate forming part of the cathode, the fluid flow field plate comprising a
fluid flow channel extending through the fluid flow field plate;
an oxidant delivery inlet coupled to one end of the cathode fluid flow conduit; and
an exhaust outlet coupled to another end of the cathode fluid flow conduit.

19. (Previously Presented) A fuel cell system according to claim 18, wherein the means
for effecting a controlled combustion within a cathode comprises a fuel supply conduit extending
from a fuel supply to a mixing point in the oxidant delivery inlet.

20. (Previously Presented) A fuel cell system according to claim 19, wherein the mixing
point comprises a reaction chamber for reacting fuel from the fuel supply conduit with oxidant
species from said oxidant supply.

21. (Canceled)

22. (Currently Amended) A fuel cell system according to claim 26, further comprising:

[[a]] the fluid flow regulator for controllably varying the quantity of fuel delivered to the mixing point.

23. (Previously Presented) A fuel cell system according to claim 22, wherein the mixing point comprises a reaction chamber for reacting fuel from the fluid flow regulator with oxidant species from the recirculation conduit.

24. (Previously Presented) A fuel cell system according to claim 22, wherein the mixing point comprises a pre-mixing chamber for mixing fuel from the fluid flow regulator with oxidant species from the recirculation conduit.

25. (Previously Presented) A fuel cell system according to claim 26, wherein the recirculation conduit is switchably connected to the fuel delivery outlet via a two way valve.

26. (Currently Amended) A fuel cell system comprising:

a fuel cell comprising an anode, a cathode, and an ion exchange membrane between the anode and the cathode;

a fuel delivery conduit comprising:

a fluid flow field plate forming part of the anode, the fluid flow plate comprising a fluid flow channel extending through the fluid flow plate;

a fuel delivery inlet coupled to one end of the fluid flow channel; and

a fuel delivery outlet coupled another end of the fluid flow channel;

a recirculation conduit for the anode, the recirculation conduit extending between the fuel delivery outlet and the fuel delivery inlet via a mixing point adjacent to the fuel delivery inlet;
and

detection means for detecting a level of oxidant species present in at least part of the fuel delivery conduit, wherein the detection means comprises means for testing an open circuit voltage across the anode and cathode of the fuel cell;

wherein the mixing point is external to the fuel cell and comprises either (i) a reaction chamber for reacting fuel, or (ii) a pre-mixing chamber, the mixing point for mixing fuel from ~~the~~ a fluid flow regulator with oxidant species from the recirculation conduit.

27. (Canceled)

28. (Previously Presented) A fuel cell system according to claim 26, further comprising:
control means for switching the fuel cell system between a normal mode of operation in which a relatively high flow rate of fuel is delivered to the anode and oxidant is delivered to the cathode, and a recirculation mode in which a relatively low flow rate of fuel is delivered to the anode together with oxidant delivered via the recirculation conduit.

29. (Previously Presented) A fuel cell system according to claim 26, further comprising:
control means for switching the fuel cell system between a normal mode of operation in which a relatively high flow rate of fuel is delivered to the anode and oxidant is delivered to the

cathode, and a recirculation mode in which a relatively low flow rate of fuel is delivered into the fuel delivery conduit together with oxidant delivered via the recirculation conduit.

30. (Previously Presented) A fuel cell system comprising:

a fuel cell having an anode, a cathode, and an ion exchange membrane between the anode and the cathode;

a fuel delivery conduit for delivering preconditioned fuel to the anode, comprising:

a reaction chamber for reacting fuel and oxidant;

a fuel supply inlet for delivering fuel to the reaction chamber;

an oxidant supply inlet for supplying oxidant to the reaction chamber; and

a reaction chamber outlet connected to the anode;

wherein the reaction chamber is external to the fuel cell and is adapted so that at least a part of the fuel supply delivered to the reaction chamber is reacted with the oxidant supplied to the reaction chamber to precondition fuel being delivered to the anode;

wherein the fuel delivery conduit further comprises a recirculation conduit to supply oxidant from an output of the fuel cell to the reaction chamber;

wherein the reaction chamber is configured to mix fuel from the fuel supply inlet with oxidant species from the recirculation conduit; and

detection means for detecting a level of oxidant species present in at least part of the fuel delivery conduit, wherein the detection means comprises means for testing an open circuit voltage across the anode and cathode of the fuel cell.

31. (Previously Presented) A fuel cell system according to claim 30, further comprising:
control means for controllably varying a flow rate of one or both of the fuel and oxidant
from the oxidant supply inlet in order to achieve a predetermined degree of humidification of a
fuel stream delivered to the anode.

32. (Previously Presented) A fuel cell system according to claim 30 further comprising:
control means for controllably varying the flow rate of one or both of the fuel and
oxidant from the oxidant supply inlet in order to achieve a predetermined degree of pre-heat of a
fuel stream delivered to the anode.

33 to 50. (Canceled)

51. (Previously Presented) The fuel cell system of claim 10, wherein the control means
is responsive to the open circuit voltage.

52. (Previously Presented) The fuel cell system of claim 11, wherein the control means
is responsive to the open circuit voltage.

53. (Previously Presented) The fuel cell system of claim 28, wherein the control means
is responsive to the open circuit voltage.

54. (Previously Presented) The fuel cell system of claim 29, wherein the control means is responsive to the open circuit voltage.